

variation measuring part 250, and thus estimates fading variations in each pilot signal transmission interval with respect to the same base station.

FIG. 16 shows estimated results output by the fading estimating part 251. The fading variation estimating part 251 outputs an estimated fading variation 108 of the leading wave and an estimated fading variation 109 of the delayed wave. These estimated variations 108 and 109 are used to determine the timings at which the despreaders 9 and 10 start to despread the received signal and weight coefficients for the RAKE combine process carried out by the RAKE combiner 12.

In the aforementioned first embodiment of the present invention, the RAKE combine is carried out by using the information concerning the phase, amplitude and timing of the pilot signal that is intermittently transmitted. Hence, the RAKE combine carried out during the time when the pilot signal is not received employs the information obtained when the pilot signal is actually received. On the other hand, according to the second embodiment, variations in the despread output signal during the time when the pilot signal is not received are estimated as described above. Thus, the RAKE combine in the second embodiment of the present invention uses the estimated results 108 and 109 and the received signal of the traffic channel. Hence, the performance of the receiver according to the second embodiment of the present invention can be further improved.

The receive level measuring unit 18 shown in FIG. 13 can determine the receive power level taking into account an influence of fading. Hence, the transmission power can be determined more precisely. The hand-over controller 19 also utilizes the variations due to fading, and can perform the take-over process more precisely.

The present invention is not limited to the specifically disclosed embodiments, and variations and modifications may be made without departing from the scope of the present invention.

What is claimed is:

1. A transmitter used in a CDMA mobile communication system comprising:

a pilot transmit unit further comprising:  
a pilot data generator which generates pilot data;  
a first modulator which modulates the pilot data;  
a second modulator which spreads a spectrum of modulated pilot data from the first modulator to thereby generate a pilot signal; and  
a timing generator which generates a timing signal applied to at least one of the pilot data generators and the first and second modulators so that the pilot signal is intermittently transmitted; and  
traffic channel transmit units which respectively transmit data signals in respect of traffic channels.

2. A transmitter used in a CDMA mobile communication system as claimed in claim 1, wherein said pilot signal has a period shorter than an interval in which the pilot signal is intermittently transmitted.

3. A receiver used in a CDMA mobile communication system comprising:

a pilot channel receive unit which demodulates pilot signals respectively transmitted intermittently in a spread spectrum formation by transmitters, and detects from the pilot signals, a timing for a traffic channel demodulation; and  
a traffic channel receive unit which demodulates data at the timing detected by said pilot channel receive unit; and the timing detected by comparing peaks of the pilot signals intermittently transmitted, the timing for the traffic channel demodulation corresponding to a greatest one of the peaks.

4. (New) A transmitter used in a CDMA mobile communication system, comprising:

a pilot channel transmit unit which is configured to transmit a pilot signal in a spread spectrum formation; and

traffic channel transmit units which are configured respectively to transmit data signals in respective traffic channels,

wherein the pilot channel transmit unit is configured to transmit the pilot signal intermittently; a start timing of the pilot signal is offset from a start timing of a pilot signal transmitted by another transmitter in said CDMA mobile communication system; and said pilot signal whose start timing is offset has a period shorter than an interval at which said pilot signal whose start timing is offset is transmitted.

5. (New) A transmitter used in a CDMA mobile communication system, comprising:

a pilot channel transmit unit which is configured to transmit a first pilot signal intermittently in a spread spectrum formation; and

traffic channel transmit units that are configured respectively to transmit data signals in respective traffic channels,

wherein the pilot channel transmit unit is configured to start to transmit the first pilot signal at a different timing from a timing at which another pilot channel transmitter in said CDMA mobile communication system starts to transmit a second pilot signal, and said first pilot signal has a period shorter than an interval at which said first pilot signal is transmitted.

6. (New) A receiver for use in a CDMA mobile communication system, comprising:

a pilot channel receive unit that receives pilot signals transmitted by transmitters in said CDMA mobile communication system,

wherein a start timing of the pilot signals transmitted by different transmitters are offset from each other, and each pilot signal has a period shorter than an interval at which each pilot signal is transmitted.

7. (New) A receiver for use in a CDMA mobile communication system, comprising:

a pilot channel receive unit which receives pilot signals transmitted by transmitters in said CDMA mobile communication system,

wherein the pilot signals start to be transmitted at different timing from each other, and each pilot signal has a period

shorter than an interval at which each pilot signal is transmitted.

8. (New) CDMA mobile communication method in a CDMA mobile communication system, comprising:

a transmitter, comprising:

a pilot channel transmit unit which is configured to transmit a pilot signal in a spread spectrum formation; and

traffic channel transmit units which are configured respectively to transmit data signals in respective traffic channels,

wherein the pilot channel transmit unit is configured to transmit the pilot signal intermittently; a start timing of the pilot signal is offset from a start timing of a pilot signal transmitted by another transmitter in said CDMA mobile communication system; and

said pilot signal whose start timing is offset has a period shorter than an interval at which said pilot signal whose start timing is offset is transmitted; and

a receiver, comprising:

a pilot channel receive unit that receives pilot signals transmitted by transmitters in said CDMA mobile communication system,

wherein a start timing of the pilot signals transmitted by different transmitters are offset from each other, and each pilot signal has a period shorter than an interval at which each pilot signal is transmitted.

9. (New) A CDMA mobile communication method in a CDMA mobile communication system, comprising the steps of:

a) transmitting, on transmit sides, pilot signals in a spread spectrum formation intermittently; and

b) receiving, on a receive side, pilot signals transmitted by transmitters in said CDMA mobile communication system,

wherein a start timing of a pilot signal is offset from a start timing of another pilot signal transmitted by another transmitter in said CDMA mobile communication system, and said pilot signal whose start timing is offset has a period shorter than an interval at which said pilot signal whose start timing is offset is transmitted.

10. (New) A CDMA mobile communication method in a CDMA mobile communication system, comprising the steps of:

a) transmitting, on transmit sides, pilot signals in a spread spectrum formation intermittently; and

b) receiving, on a receive side, pilot signals transmitted by transmitters in said CDMA mobile communication system,

wherein the pilot signals start to be transmitted at different timing from each other, and each pilot signal has a period shorter than an interval at which each pilot signal is transmitted.

11. (New) CDMA mobile communication method in a CDMA mobile communication system, comprising: a transmitter, comprising:

a pilot channel transmit unit which is configured to transmit a pilot signal in a spread spectrum formation; and

traffic channel transmit units which are configured respectively to transmit data signals in respective traffic channels,

wherein the pilot channel transmit unit is configured to transmit the pilot signal intermittently; a start timing of the pilot signal is offset from a start timing of a pilot signal transmitted by another transmitter in said CDMA mobile communication system; and

said pilot signal whose start timing is offset has a period shorter than an interval at which said pilot signal whose start timing is offset is transmitted; and

a receiver, comprising:

a pilot channel receive unit which receives pilot signals transmitted by transmitters in said CDMA mobile communication system,

wherein the pilot signals start to be transmitted at different timing from each other, and each pilot signal has a period shorter than an interval at which each pilot signal is transmitted.

12. (New) CDMA mobile communication method in a CDMA mobile communication system, comprising:

a transmitter, comprising:

a pilot channel transmit unit which is configured to transmit a first pilot signal intermittently in a spread spectrum formation; and

traffic channel transmit units that are configured respectively to transmit data signals in respective traffic channels,

wherein the pilot channel transmit unit is configured to start to transmit the first pilot signal at a different timing from a timing at which another pilot channel transmitter in said CDMA mobile communication system starts to transmit a second pilot signal, and said first pilot signal has a period shorter than an interval at which said first pilot signal is transmitted; and

a receiver, comprising:

a pilot channel receive unit that receives pilot signals transmitted by transmitters in said CDMA mobile communication system,

wherein a start timing of the pilot signals transmitted by different transmitters are offset from each other,

and each pilot signal has a period shorter than an interval at which each pilot signal is transmitted.

13. (New) CDMA mobile communication method in a CDMA mobile communication system, comprising:  
a transmitter, comprising:

a pilot channel transmit unit which is configured to transmit a first pilot signal intermittently in a spread spectrum formation; and

traffic channel transmit units that are configured respectively to transmit data signals in respective traffic channels,

wherein the pilot channel transmit unit is configured to start to transmit the first pilot signal at a different timing from a timing at which another pilot channel transmitter in said CDMA mobile communication system starts to transmit a second pilot signal, and said first pilot signal has a period shorter than an interval at which said first pilot signal is transmitted.

a receiver, comprising:

a pilot channel receive unit which receives pilot signals transmitted by transmitters in said CDMA mobile communication system,

wherein the pilot signals start to be transmitted at different timing from each other, and each pilot signal has a period shorter than an interval at which each pilot signal is transmitted.

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